PROJECT facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY
& OFFICE OF INDUSTRIAL TECHNOLOGIES

Clean Coal Power Initiative (CCPI)

05/2003

INTEGRATION OF ADVANCED EMISSIONS CONTROLS TO PRODUCE NEXT-GENERATION CIRCULATING FLUID BED COAL GENERATING UNIT

CONTACT

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PARTICIPANT

Colorado Springs Utilities
Colorado Springs, CO

LOCATION

Ray D. Nixon Power Plant
Fountain, El Paso County, CO

TOTAL ESTIMATED COST

$301,504,000

COST SHARE

DOE	$ 30,000,000
Participant	$271,504,000

Project Description

Colorado Springs Utilities (CSU) and Foster Wheeler are planning a joint demonstration of an advanced coal-fired electric power plant using advanced, low-cost emission control systems to produce exceedingly low emissions. Multi-layered emission controls will be integrated into a circulating fluidized bed (CFB) combustion unit to produce what is predicted to be the cleanest coal-fired unit in the world. The technology is expected to be cost-competitive and reliable. CSU and Foster Wheeler are planning to demonstrate this new technology at commercial scale in the 150 megawatt generating unit at the Ray D. Nixon Power Plant, located south of Colorado Springs. To control nitrogen oxides (NO_x), the system uses advanced staged-combustion that can achieve very-low furnace NO_x levels, coupled with an advanced selective non-catalytic reduction (SNCR) system that can reduce stack NO_x to levels achievable today only with higher-cost selective catalytic reduction (SCR). To control sulfur oxides (SO_x), the design features a three-stage approach to achieve high sulfur capture (96-98%) with low limestone consumption (less than half of conventional CFB systems). In addition to the advanced SO_x and NO_x control technology, the advanced low-emission combustion system includes a low-cost, integrated trace metal control system that can remove up to 90% of mercury, lead and other metals, and virtually all acid gases in the flue gas.

The combustion system is integrated with an advanced solids separator system instead of traditional cyclones. The solid separators are integrated into the traditional furnace structure, resulting in both improved reliability and lower system cost. This design allows a reduced combustor size, elimination of the traditional hot expansion joints, and improved operational performance and reduced maintenance costs. Demonstration of all of these integrated design features in a single unit, on a commercial scale, is the goal of this project. Emission performance is of key importance, but low system cost and reliability are also essential for commercial success. The project concept is depicted in the figure on the following page.

Integration of Advanced Emissions Controls to Produce Next-Generation Circulating Fluid Bed Coal Generating Unit

ADDITIONAL TEAM MEMBERS

Foster Wheeler Power Group, Inc.
Clinton, NJ

ESTIMATED PROJECT DURATION

72 months

CUSTOMER SERVICE

800-553-7681

WEBSITE

www.netl.doe.gov

Benefits

This project offers the opportunity to demonstrate a low-cost advanced emission control system for CFBs burning a variety of coals and other fuels. The system is predicted to achieve low levels of NO_x (0.04 lb/million Btu with Powder River Basin Coal), very-high sulfur control (96-98%), and trace metal emission control of up to 90% of the mercury contained in the fuel. This demonstration project will burn a variety of fuels, including Powder River Basin subbituminous, Illinois and Pittsburgh eastern bituminous, waste coal and biomass/woodwaste. If the installed technology operates successful, this unit would become the cleanest coal-fired electric power plant in the country. The plant includes a dry cooling tower to minimize water use (an increasingly important consideration in power plant design). Colorado Springs is the fastest growing city in the region and will benefit by lower power costs from using clean coal technology. Potential fuels include 20-30 million tons of coal washings from the steel industry in Pueblo, CO, an unsolved environmental problem, and deadwood removed from forests for wildfire management.